principles, both phosphorised and nitrogenised. Among the phosphorised, kephalin and myelin (both of which contain nitrogen, as well as phosphorus) are new, and are associated with lecithin. They are described as typical colloids, of no true solubility, of almost indefinite power of soaking up water so as to form an imperfect solution, of feeble chemical activity, of a remarkable readiness to combine with acids salts and alkalies, and to part with them on the addition of excess of water. Kephalin and myelin are stable, lecithin so unstable as to elude proper analysis. Similarly the nitrogenised bodies, cerebrine (Müller's), kerasine, and phrenosine, are colloids, but of less perfectly marked type, and less interesting natural history.

In his summary Dr. Thudichum, speaking of the phosphorised bodies, remarks that "we have therefore here a diversity of affinities such as is not possessed by any other class of chemical compounds in nature at present known; and the exercise of these affinities being greatly influenced by the mass of reagent and the mass of water which may be present, the interchange of affinities may produce a perfectly incalculable number of states of the phosphorised and consequently of brain matter. This power of answering to any qualitative and quantitative influence by reciprocal quality or quantity we may term the state of *labile equilibrium;* it foreshadows on the chemical side the remarkable properties which nerve matter exhibits in regard of its vital functions."

The volume now under consideration has been preceded by two volumes, containing a first and second report by Dr. Klein, on the Lymphatic System and its relation to Tubercle, a report by Dr. Sanderson on the Infective Products of Inflammation, and by Dr. Thudichum on Chemical Changes in cases of Typhus. Reports are now in course of preparation by Dr. Baxter on Disinfectants, by Dr. Sanderson on the Febrile Process and on Infective Inflammations, by Dr. Thudichum on the Chemical Constitution of the Brain, by Dr. Creighton on Anatomical Studies with reference to Cancer, by Dr. Klein on the Contagium of Enteric Fever. The whole represents four years' work, for which 8,000*l.* has been voted. The value and importance of all this work in relation to the welfare of the community, as a contribution in aid of preventive medicine, cannot be doubted by any careful reader of the record. Nor, after even a superficial reading of the record can there be doubt but that the work is of a kind which can only be set going by such means as public grants, since it involves a special training and a special devotion inconsistent with the earning of livelihood by other direct or incidental means. The grant is on the evidence justified.

But there are other aspects of the work which claim a serious regard. The department of the Government concerned in protecting the country from the invasions of contagious disease, whether represented by Minister of Health or principal medical officer, needs in all things to be fully informed of the latest discoveries in pathology, hygiene, and therapeutics. Of such minister or officer the body of scientific men whose work is here recorded, together with others who are engaged in sanitary investigations and inspections under the central authority—men like Drs. Seaton and Buchanan and Mr. J. N. Radcliffe—constitute a body of advisers or council representing the most advanced knowledge bearing upon the public health. They constitute a council to which the minister or officer may refer for latest knowledge when legislation is concerned, or for practical advice when action has to be taken. They are, in fact, at this moment practically such a council. In the Science Commission Report on the Advancement of Science, the formation of a similar council as adviser of a Minister of Science is advocated. We would suggest that we have in what we have stated an excellent illustration of the principle proposed, with a wider application, in the Science Commission Report.

THE INFLUENCE OF THE PRESSURE OF THE ATMOSPHERE ON HUMAN LIFE

Influence de la pression de l'air sur la vie de l'homme. Par D. Jourdanet. 2 vols. (Paris: Masson, 1874.)

AFTER having practised medicine for six years on the borders of the Gulf of Mexico, and rendered himself familiar with the diseases and conditions of life of the inhabitants of low levels, M. Jourdanet removed to the elevated plateau of Anahuac—more than 2,000 metres above the sea level. Here, as might have been anticipated, he found the pathological conditions different, but to his surprise he discovered that the differences were not simply such as result from temperature, or are paralleled in places of lower level and higher latitude, but presented peculiarities which he conceived to be dependent on the elevation of the situation alone. A residence of twenty years in the locality enabled him to confirm this idea and to prove that, while the blood of the inhabitants presented no poverty of corpuscles, the corpuscles themselves were deficient in oxygen, on account, as he believed, of the too feeble pressure of the atmosphere in these high regions. This led him to undertake the study of the whole question of the influence of the atmospheric pressure on health, and to call to his aid M. Paul Bert, Professor of Physiology at the Sorbonne, by means of whose experiments he believes himself to have arrived at some definite results. These, with every other possible point of interest connected with the subject, he now presents us with, in two large and beautifully illustrated volumes; leaving, however, the details of the physiological experiments to be published in a forthcoming work by M. Bert himself.

The question so fully discussed by M. Jourdanet is certainly of very great interest, and, in spite of previous observations and opinions on the therapeutic action of compressed air and on the possible limits of life in regard to height and other similar points, it is also of some novelty as treated by him.

According to M. Jourdanet the pressure of the atmosphere has not always been as small as it is now; and assuming, what is probably true, that a greater pressure would involve greater heat, he would account in this way for the warm periods known to have existed in Tertiary times. This leads him to make an hypothesis as regards the cause of the glacial epoch, the occurrence of which would be contrary to the above theory; but it is not an hypothesis that could recommend itself to geologists. The glacial epoch arose, he imagines, in this way: by some sudden convulsions the crust of the earth was torn open, and prodigious quantities of gas and vapour driven up, which forced up the atmosphere to a prodigious height, where it was chilled and its vapour condensed, which fell in diluvial torrents, leaving the air so free from vapour that radiation took place at an enormous rate, chilling the earth and causing the glacial epoch! He also concludes that on account of the too great density of air in the plain, man must have made his first appearance on elevated plateaux, and he accounts in this way for the veneration of high places among the early races. These and similar speculations, though they may sometimes amuse, do not detract from the real merit of the work in more determinable matters.

We reach the substantial part when we come to the experiments of M. Bert, of which the results are here given. Small animals were placed in chambers of various capacities, which were then filled by the same absolute quantity of air, necessarily at various pressures; when the animals were dead, the remaining air was analysed, and it was found that in the larger vessels the proportion of oxygen was greater, and this proportion was such that the total amount of oxygen left was proportional to the capacity of the chamber. The animals died as soon as the oxygen by itself was reduced to a density of 4 per cent. of what it would be if the whole chamber were filled with it at the normal pressure—the amount being thus independent of the quantities of the other gases present. This being true for any sized chamber, it follows we may suppose the chamber indefinitely large; and an animal would die in the open air if the oxygen should have less pressure by itself than 4 per cent. of 76 millimetres. Taking the air to have its ordinary 21 per cent. of oxygen, these experiments would appear to prove that life is impossible in air of less pressure than 14·5 mm. The proportion of oxygen, however, seems to be much less than that which is ordinarily supposed to be small enough to produce asphyxia. Further experiments were performed, pointing to the same result. Dogs were so fastened that they could breathe only from a bag of limited size, and from time to time the air in the bag and the blood of the dog were analysed, and it was found that the oxygen in both decreased *simultaneously*, though not at the same rate. These and similar experiments, together with the fact ascertained by M. Jourdanet, that the blood of Mexican dogs contains a less proportion than usual of oxygen, are the proofs offered that the blood cannot be sufficiently oxygenised for health without a certain amount of atmospheric pressure.

In all these experiments, however, no allowance is made for the possibility of the human lungs accommodating themselves in time to the smaller pressure, so as to enable the blood to take up a sufficiency of oxygen; and this objection is seen by M. Jourdanet, who, after giving an interesting account of the various evils that have befallen noted climbers, discusses the question whether an increased number of respirations, or an enlargement of the thorax, could counteract the effect of the rarity of the air. As to the first, numerous experiments on himself during his residence in Mexico have enabled him to verify the law given by Lehmann, that the carbonic acid expired is in part constant and in part only variable with the number and magnitude of the respirations; and he calculates from hence that, in order to counteract the loss of pressure and diminution of oxygen by increased respiration, it would require twenty-four ordinary respirations per minute, which of course the Mexicans do not make. As to the size of the thorax, which has been stated by Forbes to be larger in the inhabitants of these high regions, he objects that this statement was made on too restricted data, and that Coindet has found that it does not generally hold true. Whatever may be the truth on this point, the explanation which M. Jourdanet offers of the result of the low pressure on the temperature of the body cannot be considered satisfactory. He considers that, as a general rule, the temperature of Mexicans is not below the average, although their surface temperature often is, and that the loss of heat which would arise from the more easy radiation and the lower oxygenisation of their blood is prevented by "the repose of their functions," while their respiratory organs are specially modified so as to be capable of "exceptional exercise." The latter would require proof, and as to the former, although the body must lose temperature by the exact amount of work done on external objects, "a care to avoid every effort" would prevent the body doing work upon *itself*, and less heat would therefore be produced. The "apathy" of the Mexicans and other inhabitants of high levels must have another cause than this.

M. Jourdanet's work ranges over a wide field, discussing, without much plan, various points in connection with the climate of plateaux. Thus, in one chapter he attempts to prove, by statistics of population, that the low pestilential area round the Gulf of Mexico is more healthy than the elevated table-land, the former having increased six per thousand and the latter three per thousand in forty-seven years; that the decadence of the Peruvian race is due to the influence of the atmosphere, without apparently seeing the obvious objection that they must have *risen* under the same influence, since they are a very ancient race; that the mental and physical work of the Mexicans is below that of the inhabitants of the plains; and then he discusses the extreme height at which it is possible to live permanently, which he places between 4,000 and 5,000 metres. This variety makes the book very readable, but, in spite of its large size, the arguments on many points are too brief to be convincing.

The second volume is engaged in discussing the influence of atmospheric pressure on disease, M. Jourdanet being "convinced that the true nature of exterior influences is far better seen in the maladies caused by them than in the health which they favour." This portion of the work has a principally medical interest, although some of the results of his experience may be usefully mentioned. He finds that consumption is rare in Mexico, and is principally confined to the poorer classes who have insufficient nourishment, which he explains by their feebly oxygenised blood being unfavourable to the development of the disease;—typhus fever, on the contrary, finds there its most suitable subjects, as do other inflammatory disorders, while yellow and intermittent fevers are almost unknown.

The elevation of the country where these observations were made, and concerning which M. Jourdanet's conclusions have been arrived at, is 2,000 metres and over; and the climate of these places he speaks of as "climats d'altitude;" while intermediate heights he characterises as "climats de montagne;" to which latter he also devotes a few chapters. These, however, are of less interest as not embodying the results of his personal observations, but being a discussion of the various well-known moral, mental, and physical characteristics of mountaineers. To these follow chapters on the influence of mountain travelling on health, and detailed experiences of the application of artificial rarefaction of the air in disease.

With the desire of making the work as complete on the subject as possible, the author has compiled a large part of it from well-known writers, and recapitulates much that is of everyday observation; and these parts have naturally less interest than those which deal directly with his Mexican experiences. The whole of the facts, however, which bear upon the question discussed are conveniently collected together and put in an interesting form for the perusal of the general reader, for whom, however, much of it has too medical an aspect.

OUR BOOK SHELF

The Royal Tiger of Bengal: his Life and Death. By J. Fayrer, M.D. (London: J. and A. Churchill.)

In this small work Dr. Fayrer gives a popular description of the zoological relationships, anatomical structure, geographical distribution and habits of the tiger. Accounts are also introduced of tiger-hunts, which well exemplify the dangers to be feared and the precautions to be taken in the pursuit of that large game, which even under the most favourable circumstances cannot be followed without a great amount of risk. The author's considerable Indian experience gives great weight to his opinions on many of these points, especially with reference to the nature of the wounds inflicted by the enraged creature.

Anatomically Dr. Fayrer brings to our notice a point in the disposition of the claw-bearing or ungual phalanges of the digits in the cat-tribe, which is not without interest. In the fore-limbs, as is well known, these bones, when the claws are fully retracted, bend extremely backwards in order to allow of the claws themselves being protected during progression. To so great an extent is this retraction carried, according to Prof. Owen, that the bone passes back to the side of the second phalanx in the same way that the blade of a clasp-knife may be said to do the same with reference to each lateral portion of the handle. In the hind limb of the tiger, Prof. Owen remarks that they are retracted in a different direction, "viz., directly upon, not by the sides of the second phalanges, and the elastic ligaments are differently disposed." Dr. Fayrer finds that in the smaller Felidæ, as the Ocelot, the hind claws are constructed and retracted on exactly the same principle as the fore. Such being the case, either the tiger differs from its smaller congeners, or Prof. Owen is wrong. Till Dr. Fayrer proves the latter, we prefer to assume that the former is the case.

"Contrary to custom, I propose to give him (the tiger) precedence of the lion. He is generally described as inferior, though nearly equal, to the so-called king of beasts; but in size, strength, activity, and beauty he really surpasses him; and therefore, though he may neither be so courageous nor so dignified, he is entitled to the first place—at all events in India." Thus says our author, and many of his descriptions fully exemplify all the animal's best points. Nevertheless, though he may be slightly greater in length, and is perhaps more active, we considerably doubt his greater strength, and as the work before us fully proves, we cannot say of him as a recent writer tells us of the lion, that "it should always be recollected, before meddling with lions, that if you do come to close quarters with them death is the probable result," the tiger having a much less dignified habit, an example or two of which we quote with reference to a case in the Madras Presidency, where a sportsman wounded the creature more than once. "It charged and seized him by the loins on one side, gave him a fierce shake or two, dropped him, and then seized him on the other side, repeated the shaking and again dropping, left him and disappeared." In a second instance a military man, "a most distinguished soldier and sportsman, when following a wounded tiger on foot in the long grass, was suddenly seized and carried off by the animal he was seeking. He managed, however, to effect his escape without having received any serious injury, and rejoined his companions, who had deemed him lost."

When so acute an observer as the late Mr. Edward Blyth, with his great experience, expresses uncertainty as to whether the lion or the tiger is the larger animal, we may be certain that there is no great difference either way. Dr. Fayrer tells us, "I have been informed by Indian sportsmen of reliability, that they have seen and killed tigers over twelve feet in length." In none of the special instances he mentions, in which careful measurements were made, did the length exceed ten feet by more than an inch. We quite coincide with the author in looking with doubt on Buffon's statement that one has attained the length of fifteen feet.

For further information on the above and kindred points with reference to the Royal Tiger of Bengal, we cannot do better than recommend the reader to glance through the small work under review.

An Introduction to Animal Physiology. By E. Tulley Newton, F.G.S. (Mumby's "Science and Art Department" series of Text Books.)

In more than one of the Science Primers which we have lately had occasion to look through and notice, it has been painfully apparent that the author is not nearly so well grounded in the subject he is endeavouring to teach as even some of his probable pupils. Some write on human physiology without having studied human anatomy; others even do not know their physiology. The author of the work before us is not one of these. It is accurate, and therefore reliable. The descriptions are precise and clear. The limits of space within which the author is confined have, in some of his descriptions, made it necessary for him to sacrifice clearness to a certain extent, but this cannot be avoided. A novel feature of the work is the addition to each chapter of a practical section, in which directions are fully given for study, by the student himself, of the more simple physiological and anatomical points referred to. These directions are particularly clear, and if carefully worked out by everyone who reads the book, will be found to lead to a sound knowledge of the first principles of physiological science. The illustrations, which are numerous, though mostly to be found elsewhere, are well selected, and sufficiently large to be distinct.

Abstracts and Results of Magnetical and Meteorological Observations at the Magnetic Observatory, Toronto, Canada, from 1841 *to* 1871. (Toronto, 1875).

In this thick pamphlet of 249 pages, Professor Kingston gives the results of an elaborate, able, and discriminative discussion of the magnetical and meteorological observations made at Toronto during the thirty-one years ending with 1871, in a series of fifty-one tables. To these are appended the daily observations from January 1863 to December 1871. While all the results of the observations, devised and carried out with so much care, and extending over so long a period, are of very great value, we would point to the wind observations as regards the diurnal changes, but particularly in their relations to differences of temperature, pressure, humidity, and cloud, and to light, moderate, and heavy falls of rain and snow respectively, as affording, from the fulness and